Surgical Treatment of Chronic Rhinosinusitis in Children

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Surgical intervention for rhinosinusitis is usually considered for patients with chronic rhinosinusitis (CRS) who have failed maximal medical therapy. This is hard to define but usually includes a course of antibiotics and intranasal and/or systemic steroids and differs widely between practitioners and practice locations. Adenoidectomy with or without antral irrigation and balloon sinus dilation, and functional endoscopic sinus surgery (FESS) are the most commonly used modalities.

Adenoidectomy With/Without Sinus Irrigation and Balloon dilation. The rationale behind removal of the adenoids in patients with CRS stems from the hypothesis that the adenoids are a nasopharyngeal bacterial reservoir and the possibility that many of the symptoms might be related to adenoiditis proper. The benefit of adenoidectomy alone in the treatment of children with CRS was recently evaluated by a meta-analysis (1). The review included 9 studies that met the inclusion criteria. Mean sample size was 46 subjects with a mean age of 5.8 years (range 4.4-6.9 years). All studies showed that sinusitis symptoms or outcomes improved in half or more patients after adenoidectomy. Eight of nine studies were sufficiently similar to undergo meta-analysis and, in these, the summary estimate of the proportion of patients who significantly improved after adenoidectomy was 69.3%. Ramadan and Tiu reported on the failures of adenoidectomy over a ten year period and found that children younger than 7 years of age and those with asthma were more likely to fail after adenoidectomy and go on to require salvage FESS (2).

Maxillary antral irrigation is frequently performed in conjunction with adenoidectomy. To evaluate the efficacy of this added intervention, Ramadan and colleagues analyzed 60 children who underwent adenoidectomy for CRS (symptoms and positive scans despite prolonged medical treatment), 32 of which also had a sinus wash and culture via the middle meatus (3). All children received post-operative antibiotics for 2 weeks and outcomes were assessed at least 12 months postoperatively. Patients who underwent adenoidectomy alone had a 61% success rate at 12 months compared to children who underwent adenoidectomy with a sinus wash who had a higher success rate of 88%. Children with a high Lund-Mckay CT score and asthma had better success with adenoidectomy with a wash compared to adenoidectomy alone. In a similar retrospective study, Criddle and colleagues reviewed the records of 23 children who had adenoidectomy with a sinus wash for CRS (persistent symptoms in all and a positive scan in 7/23) followed by a course of post-op oral antibiotics (average duration 5.8 weeks) (4). If there was no improvement after the procedure on oral antibiotics, intravenous antibiotics were utilized in a small proportion of the children. Long term resolution rate was reported in 78% of the 18 patients who did not need intravenous antibiotics. This data suggests that antral irrigation adds to the efficacy of adenoidectomy and also suggests that a prolonged course of IV antibiotics (as reported above) might not be necessary to obtain a good result.

Balloon sinuplasty was approved by the FDA for use in children in the United States in 2006, and a preliminary study in children has shown the procedure to be safe and feasible (5). In this study, the cannulation success rate was 91% and the majority of the sinuses addressed were maxillaries. The most common cause of failure of cannulation with the balloon catheter was the presence of a hypoplastic maxillary sinus. Most surgeons now use the illuminated catheter to

confirm cannulation of the sinus thus avoiding fluoroscopy and its inherent risks. In a recent nonrandomized, prospective evaluation of children with CRS failing maximal medical therapy, balloon catheter sinuplasty and adenoidectomy were compared (6). Outcomes were assessed at 1 year after surgery and were based on SN-5 scores and the need for revision surgery. Twenty four/30 patients (80%) who underwent balloon sinuplasty showed improvement in their symptoms compared to 10/19 (52.6%) of the patients who underwent adenoidectomy ($p<0.05$). As some of the balloon patients also underwent irrigation, it is hard to discern the effect of dilation vs irrigation from this study. In sum, most of the available surgical data support adenoidectomy with sinus irrigation as a first step in the management of the child with CRS refractory to maximal medical management. Whether or not balloon maxillary sinuplasty imparts additional benefit to irrigation alone, in combination with adenoidectomy, cannot be established with available data to date.

Functional Endoscopic Sinus Surgery (FESS). A meta-analysis of FESS results in the pediatric population has shown that this surgical modality is effective in reducing symptoms with an 88% success rate and a low complication rate (7). Initial concerns about possible adverse effects of FESS on facial growth have been allayed by a long term follow up study by Bothwell and colleagues that showed no impact of FESS on qualitative and quantitative parameters of pediatric facial growth, evaluated up to 10 years postoperatively (8). Many advocate a limited approach to FESS in children consisting of removal of any obvious obstruction (such as polyps and concha bullosa), as well as anterior bulla ethmoidectomy and maxillary antrostomy. This approach typically yields significant improvements in nasal obstruction (91%), rhinorrhea (90%), PND (90%), headache (97%), hyposmia (89%) and chronic cough (96%) (9).

Whereas second look procedures were common after FESS to clean the cavities, the advent of absorbable packing has made it possible to avoid a second look procedure. Walner et al found comparable rates of revision sinus surgery in children with and without a second look procedure suggesting that it may not be necessary (10). Ramadan and colleagues observed that the use of corticosteroids during initial FESS might obviate a second look procedure (11). Younis in a review of available data suggested that a second look is not necessary in most children after FESS (12).

There are few reports on the causes of failure of ESS in children. The most comprehensive describes 23 of 176 (13%) children who failed FESS and required revision (13). The most common findings in these patients were adhesions (57%) and maxillary sinus ostium stenosis or missed maxillary sinus ostium (52%). In 39% of the cases, disease recurred in the operated sinuses, whereas in 26% of the cases, surgery was needed because of disease present in sinuses that were not originally operated. In another report, a retrospective review of children with CRS having undergone ESS yielded 39.6% who continued to have mucopurulent nasal drainage for more than 3 months after surgery (14). Sinonasal polyposis, history of allergic rhinitis, and male gender were significantly more frequently observed in the group that continued to have problems after ESS.

In sum, the most supported surgical approach to the child with CRS who has failed maximal medical therapy probably consists of an initial attempt at an adenoidectomy with a maxillary sinus wash plus/minus balloon dilation followed by FESS in case of recurrence of symptoms.

An exception to this statement are children with cystic fibrosis, nasal polyposis, antrochoanal polyposis, or allergic fungal sinusitis where FESS to decrease disease burden is the initial favored surgical option. Unfortunately, most of the data supporting this recommendation are not based on randomized prospective studies. It is therefore clear that prospective, randomized, controlled clinical trials should be undertaken. In these trials, severity of disease on CT scans and symptom questionnaire should ideally be matched preoperatively and the following interventions would be compared: adenoidectomy alone, adenoidectomy with a wash, adenoidectomy with a wash and balloon maxillary sinuplasty, and endoscopic sinus surgery. An additional arm that includes medical therapy might also be included.

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